A CRITICAL STUDY OF THE FOSSIL BIRD *GALLINULOIDES WYOMINGENSIS* EASTMAN

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A number of years ago, in the *Geological Magazine* of London, Dr. Eastman described one of the most interesting and complete skeletons of a fossil bird that we have in this country.[1] This remarkable specimen (see Fig. 1) was taken in the Green River shales of Wyoming, near the town of Fossil, during the summer previous to the publication of the article, and it passed into the possession of the Museum of Comparative Zoölogy of Cambridge (Massachusetts), where it still forms a part of the collection of fossil vertebrata.

During the latter part of May, 1914, I met Dr. Eastman at the United States National Museum, where he was engaged upon a study of the fossil fishes belonging to that institution. He kindly suggested that I communicate with Professor Samuel Henshaw of the Museum of Comparative Zoölogy of Cambridge, and borrow, if possible, the slab containing this fossil bird, and make a more complete study of it than he had made when the specimen first came to him for determination. This suggestion I was glad to act upon; and in a few days, through the courtesy of Professor Henshaw, the original slab came to hand for my study and description.

First of all I made two perfect negatives of the specimen (8′×10′), reproducing it nearly natural size; the reproduction of a print from one of these forms the subject of Fig. 1 in the present article.

In his account of this fossil, Dr. Eastman speaks of it as "a nearly perfect skeleton of a gallinaceous bird" (p. 54), and had he adhered to that opinion, the place he thus assigned it to in the system would never have been questioned. However, he evidently,

[1] Charles R. Eastman, "New Fossil Bird and Fish Remains from the Middle Eocene of Wyoming," *Geol. Mag.*, London, VII (February, 1900), 54–58, Pl. IV (reduced rather more than one-third).

upon subsequent examination, was convinced that he saw other features presented by it, which led him to say, on the same page just quoted, that it was one of an extinct genus of "short-billed, stout-legged birds attaining the size of a gallinule, rail, or small coot, and resembling these forms in general character."

As the supersuborder Ralliformes has no especial affinity with the supersuborder Galliformes, this last statement distinctly contradicts Dr. Eastman's first reference as cited above.[1]

As will be observed by an examination of Fig. 1, the skeleton of this fossil presents many evidences of compression. Most of the bones are of a dark chocolate color, and all of them are considerably darker than the pale-gray matrix in which the specimen is imbedded. Some of the bones have retained their normal positions in articulation, while the remainder have, for the most part, been more or less dislodged from the places they occupied in life. Some were either not in sight at all, or became, to a greater or less extent, removed from the skeleton before the process of fossilization commenced. An excellent example of this is seen in a rib which lies removed from the nearest bone to it in the skeleton by a distance of 18 mm.

This specimen was evidently "cleaned up" by an ignorant collector, and in his misguided attempts to improve it by *scraping*, he has terribly mutilated the most important parts in sight. Thus the skull has been practically ruined, and the cervical vertebrae ground down so as to present merely a longitudinal sectional aspect. Dr. Eastman, in commenting upon this, says: "Depredations of this nature are wholly inexcusable and cannot be too severely censured" (p. 55).

The head and cervical portion of the spine are seen upon direct left lateral view, and are but slightly elevated above the level of

[1] R. W. Shufeldt, "An Arrangement of the Families and the Higher Groups of Birds," *Amer. Nat.*, XXXVIII, Nos. 455–56 (November–December, 1904), 833–57. The relation of these groups is given on p. 852. Dr. Eastman asked me if I did not think there was "some tinamou in the specimen." To which I replied that I did not. As a matter of fact, there is far less tinamou in this extinct fossil bird than there is gallinule. The shoulder-girdle, sternum, and pelvis of a tinamou are entirely different, as may be appreciated by comparing the skeleton of *Nothura maculosa* Temm. with Fig. 1 of the present article. I figured a skeleton of this tinamou in the article here cited (Fig. 3, p. 839).

the matrix. As referred to farther on, the dorsal and lumbar vertebrae are considerably out of position, while all the free ribs are, to a great extent, mixed up together. At least three of the left costal ribs or haemapophyses have retained their places in articulation and are in plain sight; they are the last three of the series on that side.

Passing to the pelvis, we are to observe that it is turned entirely over, so that almost a direct ventral view is obtained of it. Posteriorly, the left femur lies obliquely across it.

Its sacrum is nearly in line with the dorso-lumbar section of the spine; and as to the skeleton of the tail, all but the leading caudal vertebrae are entirely out of sight, although I am inclined to think that the severely ground-down chain of three or four little bones, seen 3.5 cm. to the right of the left tarso-metatarsus, are the partly exposed caudal vertebrae, though the pygostyle is not in view.

The cervical portion of the spine is arched far backward over the dorsum, which is often the case with dead birds found in nature at the present time, and which appears to be due to the mode of attachment of the dorso-vertebral ligaments.

In assuming this position, the skull was likewise carried backward, although its ligamentous attachment to the atlas has been, in part, freed.

Almost a direct left lateral aspect of the sternum is presented, and all this portion is beautifully exposed. Its characters are in plain view, and will be described in full farther on in this article.

The left coracoid has been but slightly dislodged from its coracoidal articular groove on the anterior part of the sternum, and is consequently seen practically *in situ* with respect to the latter bone. This is almost as true of the left scapula, for it occupies nearly a normal position—that is, with respect to its coracoid, the os furculum, and the sternum.

On the other hand, the right coracoid is entirely disassociated from all the remaining bones of the pectoral arch, and now, with its anterior surface exposed, it lies back of the os furculum, in contact with the two clavicular limbs of its arch. We have in view the antero-oblique surface of the furculum, and consequently we have a left latero-oblique side of its hypocleidium exposed.

The right scapula is entirely free, being in full view except the parts covered by the os furculum and the left coracoid which are in front of it, the former almost completely hiding its head. Somehow, its distal head came to get in front of the ends of the vertebral ribs of the left side (see Fig. 1).

With respect to the sternum, it is to be observed that its pair of left xiphoidal processes, as well as the extreme posterior tip of the carina, overlap the shaft of the right femur—the former entirely and the latter as far as the inner condyle.

Perfect in nearly all respects, the right pectoral limb is drawn forward in front of the trunk skeleton, it being crossed by the cervical vertebrae at the distal third of the humerus,[1] which latter has its palmar aspect exposed to view, while it is the anconal sides of the bones of the antibrachium and pinion which are exposed—the forearm and manus having twisted once round before settling down. Curiously enough, the interosseous space between the radius and ulna of this limb is filled in with dark, fossilized structures, as though the muscles of the forearm had become mineralized instead of having been destroyed either by putrefaction or maceration.

Both the ulnare and the radiale of the carpus are in sight, while the skeleton of manus is perfect.

With its longitudinal axis parallel to that of the fellow of the opposite side, the left humerus appears to be free, with its radial side exposed to view.

Passing to the pelvic limbs, they are seen to be nearly perfect, and are so, all to the patellae (which may have been small or not in sight) and some of the pedal phalanges, which will be enumerated farther on. Neither femur was freed at its pelvic articulation, the head, in each case, apparently being still in the cotyloid cavity of the pelvis of the respective sides, as in life, while all the articulations among the long bones below are but slightly out of place in any particular instance.

[1] Dr. Eastman evidently mistook this right pectoral limb for the left. That it is the one of the right side is made almost certain by the fact that the cervical vertebrae would naturally be between the two humeri, when the former was curved backward and the latter drawn forward and upward, as is the case here.

FIG. 1.—*Gallinuloides wyomingensis* Eastman. Reproduction from a photograph of the specimen *in situ*, made direct from the slab by the author; nearly natural size.

On the whole, these limbs are drawn out nearly directly backward, just as though the skeleton had been in running water, the stream passing posteriorward, and these pelvic limbs had, before finally settling down, drifted into the positions in which they were eventually preserved; while the pectoral limbs, influenced by the same current, perhaps periodically flowing to and fro, had previously *lodged* finally in the positions they now are in in their stony matrix. Naturally, the head and neck floated backward with the legs.

The longitudinal axes of the femora are quite parallel to each other; those of the tibio-tarsi are at a slightly open angle, which is also true of those of the tarso-metatarsi, that is, supposing the imaginary lines of their longitudinal axes to be extended toward the pelvis in each instance. The right femur has its anterior surface exposed; the left its latero-internal. In the leg, both fibulae are visible; and in the case of the one on the left side, its proximal head can be plainly seen in the cleft of the external femoral condyle intended for its accommodation and articulation.

Notwithstanding the fact that the distal condyles are very prominent and the intercondylar valley rather deep, the right tibio-tarsus and fibula evidently have their direct posterior aspects exposed, with the fibula next to the median plane. In other words, these two bones, maintaining their articulatory relations, have once rotated over on their longitudinal axis, while the prominence of the distal condyles, over what they naturally possess on this posterior aspect of the tibio-tarsus, has evidently been produced by transverse pressure.

In the case of the left tibio-tarsus, which likewise has maintained its mutual and normal articulatory relations, it presents its antero-externo-lateral aspect.

Either tarso-metatarsus has its almost direct anterior surface exposed, and these are, in each case, thrown but slightly out of place with respect to their articulations with the tibio-tarsi.

The phalanges of the right pes are exposed almost entirely on mesial aspect, and the bones are all present, the joints of the second toe being seen on their dorsal aspects, which, with the exception of hallux, is the case with all the phalanges of the left foot. Here some of the joints are missing, having been broken off and lost. This is

the case with the anterior half of the third phalange of the mid-anterior toe, as well as its entire ungual joint. In the case of the outer toe, all is lost beyond the posterior moiety of the third phalange; finally, the osseous claw of hallux, in the case of this foot, is gone.

All the bones of the hyoidean apparatus are either entirely hidden in the matrix, or else they have drifted away from the skeleton prior to the time of its fossilization. In the left orbit, the circlet of sclerotal platelets are still *in situ* and completely fossilized. The lower mandible is duly articulated, and the bony jaws are tightly closed together.

Dr. Eastman presented a number of accurate measurements of this specimen in his article (p. 56), which were as follows:

TABLE OF MEASUREMENTS

(All *lengths* given in millimeters)

	Mm.		Mm.
Head	48	Manus	46
Scapula	48	Femur	42
Coracoid	27	Tibia	58
Furculum	33	Tarso-metatarsus	34
Christa sterni	58	I. Digit (7, 4)	11
Humerus	47	II. Digit (11, 8, 6)	25
Ulna	49	III. Digit (12, 10, 8, 6)	36
Radius	45	IV. Digit (7.5, 5.5, 4, 4, ?4)	25

Height of knee-joint (estimated) 90
Total height (estimated) 220

To these I may add some of my own measurements (also in millimeters), which are:

SUPPLEMENTARY TABLE

	Mm.
Length of mandible (approx.)	38
Height of skull (cranium)	20
Longitudinal diameter of left orbit	9
Length of carpo-metacarpus	25
Proximal phalange of index digit	12
Distal phalange of index digit	9
Pollex digit	11.5
Medio-longitudinal length of pelvis	43
Length of pubic bone	32
Greatest width of posterior moiety of pelvis	29
Depth of sternum (anteriorly)	30

The skull.—As already pointed out above, this part of the skeleton has been rendered almost useless through the scraping given it by the collector. Still, there is something to be said of it, for even its outline teaches a little, though in regard to this, Dr. Eastman made no comments whatever, beyond deploring the mutilations which have been committed.

Taken in connection with the mandible, the form of the skull of this fossil bird was distinctly of the gallinaceous type, which will be readily appreciated by comparing it with that of any true and average grouse, partridge, or pheasant. Several of these are shown in previous papers of mine (see footnote 1). In general, the characters are the same in all of these. In the specimen under consideration, the external narial aperture was of moderate size, and possessed the usual elliptical outline; the quadrato-jugal bar was slender and straight, while the postfrontal and squamosal processes were united at their anterior apices as in *Bonasa.* A lacrymal bone was of some size, and had a form such as we see in *Phasianus colchius*,[1] while a nasal beyond it closely resembles that element of the cranium in any average tetraonid that has its maxillary process narrow and delicately formed.

There is a good character in the antero-terminal portion of the superior maxillary or upper mandible, for it has a contour that is strictly gallinaceous in all respects,[2] and is essentially quite different from anything of the kind we find either in the rails or in gallinules.

Vertebral column.—There were fifteen vertebrae in the cervical division of the spine before we come to one which is considered to be the first dorsal vertebra, as it has a pair of true ribs connecting with the sternum by means of costal ribs. This is the sixteenth of the spine, and its ribs and the connecting costal ribs or haemapophyses can easily be made out in the specimen. Whether the fifteenth bore a small pair of free ribs cannot be stated positively, as they are not in sight in that vertebra.

[1] R. W. Shufeldt, "*Osteology of Birds*," State Museum Bull. 130, N.Y. State Museum, Albany, 1909, *Gallinae*, Pl. 2, Fig. 18.

[2] R. W. Shufeldt, "Observations upon the Morphology of *Gallus bankiva* of India," *Jour. Comp. Med. and Surg.*, New York, July, 1888, Vol. IX, No. 4, art. 21, pp. 343–76, 30 figures in text (pmx.).

The dorsal portion of the spine, the thoracic ribs, and the costal ribs are in such a demoralized condition that it would be quite unsafe to make any positive statements in regard to them. There seem to be, however, two free vertebrae just in advance of the pelvis, and each has its centrum rotated into view. In most grouse and other gallinaceous forms there is a single vertebra between the pelvis and the four which coössify into one piece in the dorsal series. If this were the case with respect to the specimen under consideration, and we find, as I say, two free ones anterior to the pelvis, it may be explained by the fact that the fossil skeleton belonged to a subadult individual, which died before the co-ossification of the dorsal vertebrae took place. I do not say that this was the case; but I will say that, were I to find all the rest of this skeleton of this fossil to be typically gallinaceous—and all the dorso-lumbar vertebrae were hidden from sight—its dorsals were four and all in one bone, while between it and the pelvis would be found another single, free vertebra. This would surely be the case were the individual an adult bird.

The ribs were slender, and those in mid-series apparently bore "epipleural appendages," as at least in the case of one rib the process can be seen; they are never very prominent or strong in the *Gallinae*.

In the rails and gallinules the number of cervico-dorsal vertebrae between the skull and the pelvis is greater than in any of the true gallinaceous forms, while in the former the dorsal vertebrae never unite to constitute a single bone.[1]

The pelvis.—Owing to the fact that the ventral aspect of this bone alone is exposed, only its characters upon that aspect can be touched upon. These indicate that the gallinaceous nature of them is very distinctly marked, and that this pelvis would answer for any grouse of average size, such as *Bonasa umbellus* for example. These characters, too, are better shown in such a pelvis as the one possessed by *Centrocercus* than is the bone in such a bird as *Thaumalea picta*. Were its dorsal aspect exposed, in the fossil specimen here being considered, it would closely resemble the pelvis of *Bonasa*

[1] R. W. Shufeldt, "Osteology of *Porzana carolina*," *Jour. Comp. Med. and Surg.*, New York, IX (July, 1888), No. 3, art. 17, pp. 231–48. (Seven figures.) See p. 7.

umbellus, which I figure in my *Osteology of Birds*, published by the New York State Museum at Albany (Pl. VI, Fig. 26).

Anteriorly, the bone is broad, with its iliac borders rounded, the lateral margins being concaved inward toward the sacrum. This latter, on its ventral aspect, presents a longitudinal, median furrow, which extends posteriorly as far back as a point opposite the acetabulae. This, taken in connection with the decided enlargement of the sacrum between the cotyloid cavities and its anterior termination, presents us with a very common character of the pelvis in gallinaceous birds generally. It is well shown in the pelvis of *Centrocercus*. In these gallinaceous birds, too, the anterior sacral vertebra is always prominently produced downward through the form of its centrum, a feature to be noticed in the pelvis of any typical tetraonine species.

Posteriorly, this pelvis is likewise broad, with the free margins of its ilia behind unnotched in any way. The pubic elements are slender in form and of nearly uniform proportions throughout, while posteriorly they extend for some little distance beyond the ilia. In fact, they agree, as do all the other characters of this pelvis, with the corresponding ones in the pelvis of any typical tetraonine species of the present time (Fig. 2).

In the gallinules and other rail-like birds, the pelvis possesses an entirely different character, it being much narrower throughout, with anteriorly truncated ilia and other features, which are clearly to be observed in my figure of the pelvis of *Porzana carolina* referred to above.

Further, I have stated that "in a great many particulars, *Porzana*, *Crex*, *Rallus*, *Ionornis*, *Fulica*, and *Gallinula* agree in their osteology,"[1] and this, in all probability, is true of the remainder of their morphology.

The sternum and shoulder-girdle.—Little need be said by way of description of the sternum of this specimen, for it is so typically

[1] R. W. Shufeldt, "On the Osteology of Certain Cranes, Rails, and Their Allies, with Remarks upon Their Affinities," *Jour. Anat. and Phys.*, London XXIX (October, 1894), N.S., IX, Part I, art. 5, pp. 21–34. Text figures. A paper on the descriptive osteology of all the species constituting this group of birds in North America has recently been accepted for publication by the *Anatomical Record* (Wistar Institute, Philadelphia) and will appear in due course.—R. W. S.

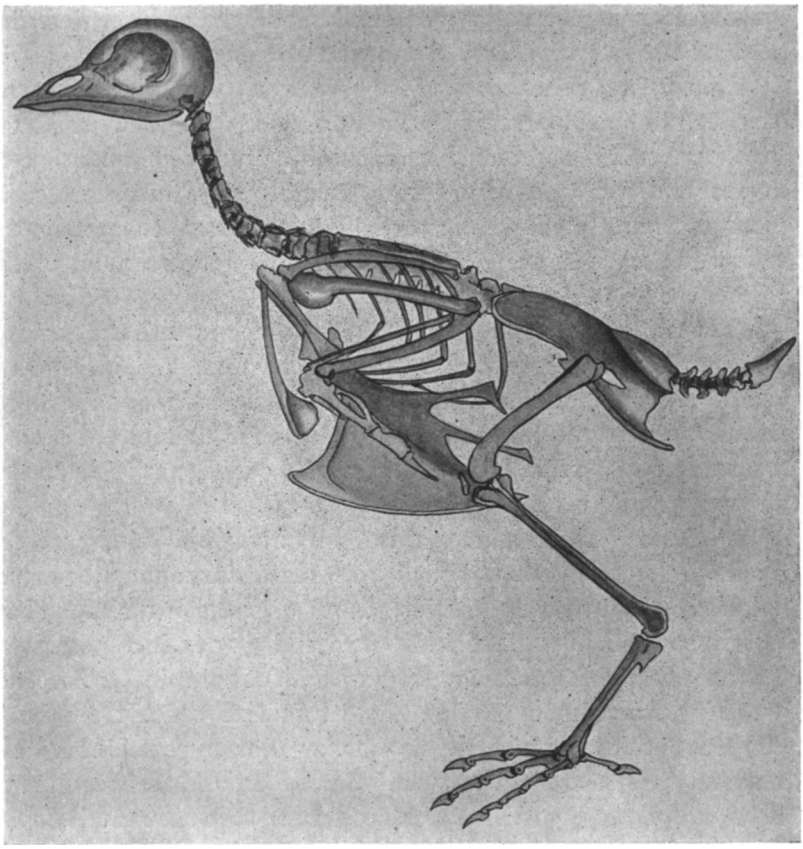

FIG. 2.—Skeleton restoration of the fossil bird *Gallinuloides wyomingensis* Eastman. Made and drawn by the author, guided by the fossil specimen belonging to the Museum of Comparative Zoölogy of Harvard University, kindly loaned him for the purpose. For amount of reduction compare with measurements given in the table above. In some of the bones their actual morphology is closely given. The outline of the skull agrees with the specimen. The cervical vertebrae as drawn are intended to number some fourteen or fifteen. In drawing the pelvis, assistance was given through study of the general tetraonine form of that bone. The free caudal vertebrae and pygostyle are as they occur in related gallinaceous birds. In the case of the ribs, they are in part as in the specimen, while the sternum and bones of the shoulder are entirely so, and agree, in all particulars, with those bones in the specimen of *Gallinuloides* here considered. With respect to the skeleton of the pectoral and pelvic limbs, the bones have the general outline of the corresponding ones, in any particular instance, in the original, and the proportionate lengths are actual.

In making this drawing, I intentionally omitted to include the limbs of the right side, as nothing would be gained by showing them, and they would needlessly complicate the figure. Measurements of the long bones and others are given in the text; and from these measurements, taken in connection with this drawing and other data presented, a very complete conception of the morphology of the skeleton in this fossil bird may be obtained.

gallinaceous in character that similar ones have been described many times in various works on avian osteology. Moreover, with its deep carina; concaved anterior border; a pair of long, somewhat slender, xiphoidal processes on either side, with their expanded, free extremities a prominent manubrial process of quadrilateral form; and finally, a very narrow sternal body, and short costal borders where the costal ribs articulate—all these characters, and a few minor ones, are plainly to be seen in the sternum of this specimen.

This style of sternum agrees in all particulars with that bone as we find it in *Bonasa umbellus*, exhibiting various modifications in the style of sternum found in the genera and families of all gallinaceous birds, in all parts of the world, as for example pheasants, guans, grouse, partridges, guinea-fowls, quails, turkeys, and all their allies and congeners.[1]

Had I seen the sternum of this fossil bird and no other part of its skeleton, I could, without the slightest hesitation, and without having laid eyes upon the coracoids, scapulae, or the os furculum, have described them in all detail. No fowl, living or extinct, possesses a sternum in all respects agreeing with that bone in *Gallinuloides wyomingensis* without having an os furculum which is of the U-shaped pattern, with a large, subtriangular hypocleidium. The clavicular limbs are of nearly uniform caliber, and the free superior ends are but very slightly enlarged. Both *Gallus* and *Bonasa* possess an os furculum of identically the same character, while *Gallinula*, *Fulica*, *Rallus*, and the rest, possess a very different form of one, and one that is more or less compressed antero-posteriorly, without any hypocleidium worth mentioning.

Either coracoid is large, above the average in length for ordinary birds of this size, apart from the gallinaceous group, with the sternal

[1] Richard Owen, *Comp. Anat. and Phys. of Verts.*, II, 27; R. W. Shufeldt, "Osteology of Birds," New York State Museum Bull. 130, p. 183, Figs. 8 and 9 (*Gallus bankiva*); Max Fürbringer, *Ueber Morph. und Systematik der Vögel*, II, Table VI, Figs. 43, 44, 45; on the same plate these may be compared with the sternums of *Fulica*, *Rallina*, and *Crypturus*, in order to exemplify the differences between the galline sternum and the bone as it occurs in rails, gallinules, and tinamous; A. Chauveau, *Comp. Anat. of the Domestic Animals*, p. 113, Fig. 73; T. H. Huxley, *Anat. Vert. Animals*, p. 241, Fig. 81; W. K. Parker, Art. "Bird," *Encyclo. Brit.*, 9th ed., III, 720.

end but moderately expanded, and the head of the bone of a corresponding degree of development.

The inferior or lateral external process is practically very small and this is likewise the case with the "praecoracoidal process" at its superior extremity. With respect to the latter, Dr. Hans Gadow has remarked that this is "but very small or absent in *Apteryx*, *Tinamous*, *Steganopodes*, *Gallinae* and *Passeres*."[1] In its general character, this coracoid agrees closely with that bone as found in the extinct fossil species of *Palaeortyx* and *Palaeoperdix*, as described by Milne-Edwards, Lydekker, Gervais, Depéret, and others.[2]

A scapula is a long, slender, and narrow bone, but slightly curved, and with a small, nib-like expansion at the distal end, which is broken off in the specimen, leaving only its impression in the matrix. In short, the pectoral arch in *Gallinuloides wyomingensis* is quite typically gallinaceous, and essentially agrees with the pectoral arch in the skeletons of existing species and genera of North American *Tetraonidae*, especially with that part of the skeleton in *Bonasa*.

Skeleton of the limbs.—The long bones of the extremities exhibit in a few instances some flattening and slight distortion as the result of pressure. This has not, however, altered or concealed their various characters, but may be clearly made out in most instances. This is particularly the case with the skeleton of the pelvic limbs, which agree, in all respects, with the corresponding bones in the skeleton of an average grouse. When I say this, I refer especially to the tibio-tarsi and metatarsi, which are quite typical. It also had a grouse's wing, in so far as its skeleton goes, as may be easily proved, not only by such characters as have been preserved, but by the relative proportional lengths of the bones of the brachium, antibrachium, and manus. These relative proportional lengths are of some considerable value in making such comparisons, as, within

[1] *A Dictionary of Birds*, by Alfred Newton, assisted by Hans Gadow, with contributions from Richard Lydekker, Charles S. Roy, and Robert W. Shufeldt, p. 857 (footnote).

[2] Compare with the coracoid of *Palaeortyx maxima* of Lydekker in *P.Z.S.* (1893), p. 520, Pl. XII, Fig. 11; see also my figures of the coracoid and the os furculum of *Tympanuchus* in Hayden's 12th *Ann. Geol. Surv. of the Terr.*, p. 716, Pl. XII, Figs. 86 and 87.

certain limits, they hold true for members of the same family, and in several families differ very widely.

CONCLUSION

The extinct fossil bird which has been very fully considered in the present paper was one rather smaller than the North American ruffed grouse (*Bonasa umbellus*), to which it was quite closely affined. Were it in existence today, its place would have been in the family *Tetraonidae*, and near *Bonasa*, *Canachites*, and *Lagopus*, with which forms it holds many, indeed all, tetraonine skeletal characters in common. That it was a bird possessing strong volant powers is abundantly shown by the deep keel to its sternum, and the powerful development of its pectoral arch and wing; these offer ample evidence of this fact. Without doubt it had a flight quite coequal with that of any ordinary grouse.

This form was in no way related to the *Rallidae*, or any similar group, and certainly not to the gallinules. Moreover, when we come to find early Eocene forms of the *Tetraonidae* that exhibit in their skeletons a departure from the true tetraonine stock, it will not be a form of bird having in its skeleton paludicoline characters, and particularly not ralline ones. No such alliances have existed at any time in the world's history.

Annectent forms, possessing a good proportion of tetraonine or galline characters in their generalized organizations, will also exhibit skeletal characters connecting them with the pigeons and their near allies (*Columbae*), and such birds are still found to exist in the world's avifauna, as witness the sand grouse and others (*Syrrhaptes paradoxus*). In fact, the pigeons and fowls, as we know, possess many morphological characters in common at the present day.

As to finding the fossil remains of a true gallinaceous bird in the Green River shales of Wyoming (Middle Eocene), it need not surprise anyone, for true grouse forms occurred in corresponding formations elsewhere, not only in this country but in Europe. This is likewise true of the *Phasianidae*, a matter which I have abundantly proved in a memoir on the subject recently published entitled "Fossil Birds in the Marsh Collection of Yale University," and published in the *Transactions of the Connecticut Academy of Arts and Sciences*, XIX. (February 1915), 1–110.

The generic name *Gallinuloides* is a very misleading one as applied to the present bird, and matters have not been improved by the creation of a family *Gallinuloididae*.[1]

This bird, as I have remarked above, was a true grouse; but whether it can be placed in any existing genus of our North American *Tetraonidae* is another matter. It belongs in the near neighborhood of *Lagopus* and *Bonasa*, and probably in a genus of its own. For such a genus, did the "Canons of Zoölogical Nomenclature" (Canon XXXI) admit of it, I would suggest the name of *Palaeobonasa*. And if at any time in the future such changes are made, under additional rules to meet cases of the kind, this extinct species should then be known as *Palaeobonasa wyomingensis*.[2]

[1] Frederic A. Lucas, No. 4, "Characters and Relations of *Gallinuloides wyomingensis* Eastman, a Fossil Gallinaceous Bird from the Green River Shales of Wyoming," *Bull. Mus. Comp. Zoöl. at Harvard Coll.*, XXXVI (1900–1901), 79–84. Illustrated.

The author of this well-known paper says of the fossil bird here being considered that "its galliform nature is obvious at a glance"; and while he states that it was a "bird of about the size of a ruffed grouse" (which is correct), he falls into the error of stating that "the majority of its structural resemblances are with the curassows and with the genus *Ortalis* amongst those birds," and the still more remarkable error in the statement that "the bird presents no points of affinity with any of the American grouse, still less with any of the *Odontophorinae*."

The writer is very careful to make no reference whatever to the fact that this fossil bird is in no way related to the gallinules; nor does he make any effort (through change of name) to disabuse the mind of the palaeontologists of the incorrectness of that reference. When any animal has been incorrectly classified, it is a distinct advantage to science to rename it, as it is relegated to the group to which it in reality belongs. Moreover, Lucas emphasizes the error made in the original reference by suggesting the creation of the family *Gallinuloididae*, which has, unfortunately, already passed into palaeornithological nomenclature (*A.O.U. Check-List of North American Birds*, ed. 1910, p. 388, etc.).

It may be said here that I figure (natural size) the trunk skeleton of a specimen of *Ortalis macalli* in my *Osteology of Birds*, and give an account of the skeleton of this species (p. 240, Pl. 4, Fig. 21). As compared with the fossil, especial attention is invited to the broad ribs, short and wide external xiphoidal processes of the sternum, and the small hypocleidium of the os furcula in *Ortalis*.

[2] Gen. name = Gr. παλαιός, ancient, and Sp. name, Gr. βόνασος, a wild bull. *Bonasa* was so named on account of the "drumming" practised by the bird at certain times, which has been considered by some to sound like the bellowing of a bull; in other words, an ancient form of *Bonasa*. As I have elsewhere shown, *Bonasa*, of all our North American grouse, comes nearest to the quails and partridges, and it is quite likely that this extinct species possessed some osteological characters in its skeleton which would indicate such an affinity still more plainly.

There have not been many fossil forms of ralline birds described for North America up to the present time, while typical gallinaceous species are, as I have said, by no means rare. Over twenty years have passed since I described *Crecoides osbornii*, a species I then considered as being related to the genus *Crex* among the *Rallidae*.[1] No fossil gallinules have been found anywhere apparently, the nearest form being *Porphyrio mackintoshi*, from the Pleistocene of Queensland, Australia, a specimen which I have not seen.[2] The fossil remains of several extinct forms of *Notornis*, however, have been described, and about five species of *Fulica*, from various and widely separated parts of the world, one of which is from the Pleistocene of Oregon (*F. minor* Shuf.).

[1] R. W. Shufeldt, *Jour. Acad. Phila.*, XI (1892), 412.

[2] De Vis (p. 193, note).